COURSEWARE FOR DRIVING SIMULATION

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ABSTRACT

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This project is to develop a Courseware of Driving Simulation. Driving simulation is a simulation of driving environment. Driving simulation is useful but not commonly used by driver for driving learning purpose. Thus, the car driving accidents increase sharply. Main purpose for develop the courseware of driving simulation is to decreasing car driving accident case and provide a platform to driver for training their own driving skill. The new driving simulation software will be providing a serious game training on driving skill. User will use either keyboard or other hardware to control the car and multiple driving learning courses will be providing inside the simulation. At the end of the simulation process, result of evaluating the performance during the course will be shown. In a nutshell, user can review their result and realise which driving skill is their weakness thus can improve their skill.

Keywords: Driving simulation, Driver, Courseware

ABSTRAK

Kursus untuk Simulasi Memandu

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Projek ini adalah untuk membangunkan satu Kursus Memandu Simulasi. Memandu simulasi adalah simulasi persekitaran memandu. Memandu simulasi adalah berguna tetapi tidak biasa digunakan oleh pemandu untuk memandu tujuan pembelajaran. Oleh itu, kemalangan memandu kereta meningkat dengan mendadak. Tujuan utama untuk membangunkan perisian kursus memandu simulasi adalah untuk mengurangkan memandu kereta kes kemalangan dan menyediakan platform untuk pemandu untuk melatih kemahiran memandu mereka sendiri. Perisian simulasi memandu baru akan menyediakan latihan permainan yang serius untuk memandu kemahiran. Pengguna akan menggunakan sama ada keyboard atau perkakasan lain untuk mengawal kereta dan pelbagai kursus pembelajaran memandu akan menyediakan dalam simulasi. Pada akhir proses simulasi, keputusan penilaian prestasi semasa akan ditunjukkan. Secara ringkasnya, pengguna boleh menyemak keputusan mereka dan menyedari mana kemahiran memandu adalah kelemahan mereka itu boleh meningkatkan kemahiran mereka.

Keywords: Simulasi Memandu, Pemandu, Kursu

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PART 1

INTRODUCTION

1.0 Introduction

Driving has become a common way being transportation into our daily life style. Besides that, some countries regard driving as a representation of freedom and independent. Thus, increasing of driver will cause the increasing of accident case not only because of the number of driver increases but due to the insufficient experience's beginner driver and high aged adult driver. To solve this problem, practice is a must for those learners. So the driving simulation are the best way to solve, decrease, improve, protect and train their problem on driving skill, accident case, driving ability and most importantly their precious life.

What is driving simulation? Driving simulation is the simulation of driving environment which can be used for entertainment as well as in training for driver's education. The driving simulation basically has three major purposes which are training, analysis and evaluating the driver driving skill, technique, response and behavior. First for training part is a practical to train the driving skill and technique in order to impart the safe driving technique for them. Secondly for the analysis part is to show and analysis the user who using this simulation of their performance, behavior and responses so they can realize what is their weakness on driving skill. Thirdly the evaluating part is for the driving educational school, they can refer the evaluating result from this driving simulation to decide and given the suitable and proper lesson for the driving learner. So what is driving simulation courseware? Driving simulation courseware can be considered as a portable driving simulator because only installations inside computer are essentially needed. Unlike other driving simulator which are unmovable for example like National Advanced Driving Simulator, SIMUVEG, Portable In-vehicle Driving Simulator, TUTOR and etc. User just need to install this courseware inside their computer then can start using this driving simulation.

1.1 Problem Statement

Old age adult people and beginner driver have low or lack of driving performance on road which are high risk danger not only to themselves but all road users. Beginner driver don’t have enough experience, low performance and lack of confidence when driver on road. They are easily nervous and unable to make a correct decision or response when facing certain incident on road driving.

For example the changing of weather condition, the traffic jam situation, the road sign, signboard on road, traffic light, and many sudden incident happen which can make them nervous and lost their steadiness to make a good decision or action. Old age adult have enough driving experience but some of them have long period away from vehicle. This may cause them dropping of their driving standard, cognitive, mental and physical ability. These effects could bring along the increasing of accident risk on road driving.

Besides that, some driving’s rule on road which had been changed so they are unable to realize due to the long period away from society. In addition, current driving simulation system did not input the local traffic rules which will becoming an issue for the foreigner user due to unfamiliar of local traffic’s rule and driving pattern.

1.1.1 Purpose of project:

To develop a driving simulation courseware that will enhance, train and solve beginner driver or old age adult people’s driving skill, performance, technique, driving responses and driver’s behaviors.

1.1.2 Objective of project

i. To create an interactive learning environment for beginner driver to learn the basic traffic rules and local driving pattern information.

ii. To develop a courseware that helps to increase the learning skills of beginner driver by practicing the simulation compare to study from book that less effective.

iii. To show the driver performance and result through this simulation can help user to understand where the mistake occur.

1.1.3 Scope of project

This driving simulation software more or less is target for the beginner driver and the high aged adult driver. This software can be used in driving school, home and any location which located with computer since this software is portable installing inside computer then straight can use it. This software currently main platform is computer. This software will collect the data from the user driving analytic for example the mistake count through this driving simulation, the time for certain mission, the smoothness of controlling the car, the driver’s behavior when driving the car and many else. The technique will be used or apply are mainly using 3D modeling and Virtual Reality.

1.1.4 Conclusion

In this chapter, the driving simulation is to improve the beginner driver and high aged adult driver to improve, regain, maintain and understanding the ability, performance, response, skill, rule, negative and positive action. Since this is portable by installing inside computer then can straight using it. This software’s advantages obviously are save cost, time and safe. Comparing to test-track, on-road, instrumented vehicle, and many other driving simulators. The effect from this driving simulation can be an aid to a lot of sector in society which help them to reduce the danger and accident case on road toward not just driver but to all road users.

1.2 Literature review

1.2.1 Existing system: National Advanced Driving Simulator (NADS) and CarSim

NADS is the National Advanced Driving Simulator which located in the University of Iowa’s Oakdale Research Park Campus. National Advanced Driving Simulator can consider a center or a home which provider a huge range of simulator by giving varies level of driving realism. NADS’s employees are collection and the combination of all different area of expert in driving simulator to develop best and high technology system.

The Development and Research team in NADS are sponsor by government, military, and industry partners which aim to saves lives, improves quality of life for vehicles, advances the state of the skill in driving simulation, and improves the efficiency and productivity of the vehicle manufacturing sector. This simulation aim to improve and solve the problem of infeasible, too costly, or unsafe in the real world, also including the assessing of cognitive or physical ability, receive and analyses the performance and driving behaviour of the system. Figure 1.1 shows the structure of National Advanced Driving Simulator.

Figure 1.1: structure of National Advanced Driving Simulator

CarSim is one of the driving simulator which been used widely in the world now. CarSim consist many type which different in size and price from $20,000 Desktop system until $100,000,000 full-vehicle simulator. Most of the CarSim simulator only locates at some research factory, University and some big company due to the high build cost. So CarSim developer team has develop some low cost system like CarSimDS from mechanical simulation technique. Figure 1.2 show the structure of CarSimDS model. There are several advantages from using CarSimDS like low-cost, real-time operation in Windows environment by using the standard PC. Besides of the driving skill training purpose, it suitable for car engineer to test their concept car by using the virtual car inside the simulator on proving ground roads and analysis how the vehicles behave. Figure 1.3 shows the CarSimDS using laptop as platform for operate the driving simulation. Data analysis and data collection from this simulator can be used for discriminate the difference in tires, stability control algorithms, race car chassis setups, and many other items.

Figure 1.2: structure of CarSimDS

Figure 1.3: structure of CarSimDS on laptop

1.2.2 Improve beginner driver's performance

To improving the beginner driver's performance, confidence and the fast response on road driving through driving simulation. Practices make perfect which is true for the thing that no familiar with so beginner driver can using this system for training and practice purpose. According to Lisa Dorn (2005), it would appear that professional driver training affects simulated driving performance with trained drivers demonstrating a potentially safer driving style than untrained drivers. Besides that, according to Anderson (1980), early research has demonstrated improvements in accident risk. McKenna (2006) reported that hazard anticipation in driving can be significantly improved by training in the laboratory using video simulation techniques. In addition, Lonero (2008) states that nowadays, there is a much better appreciation of the strengths and shortcomings of driver training programmers and new technologies are available to deliver training programmers more effectively. Which can conclude that the driving simulation can improve the driving's performance.

1.2.3: Assisting high age adult driver to regain their driving technique and ability

To help old age adult driver to maintain, improve and regain their driver performance and ability by using this portable driving simulation software compare on-road test or practice. This is because some of the eldest over confidence their driving skill. According to Holland(1993), Marattoli and Richardson(1998), Groeger and

Brown(1989) state that Older drivers generally perceive their driving ability to be better than or equal to that of their peers and better than that of younger drivers. According to J Gerontol (1994), Our driving population is aging and faces increased risk for injury and death from motor vehicle crashes. Over confidence and unwilling to train are dangers for high age driver. According to Groeger and Brown (1989), Holland (1993), and Marottoli and Richardson (1998), older drivers assign high ratings to their perceived driving ability. So this system not only to repair, recover and regain their driving skill but also decreasing the risk of their danger from accident.

1.2.4 Data analysis

Data analysis through this simulation can help user to understand the mistake or the bad habit which they always done eventually they able to change it. According to Bryan Reimer(2006), Lisa A. D’ambrosio, Joseph F. Coughlin, and Michael E. Kafrissen(2006) and Joseph Biederman(2006) state that, to draw inferences confidently about real driving behaviors from driving simulation data. According to Bella (2008), Godley (2002), Lee (2004), Törnros (1998) and Yan (2008) state that simulation can provide a valid index of driving performance. Therefore, the result of data index from the simulation can be analysis to visualize the mistake which cause by the user.

1.2.5 Learning from mistake

Beginner driver able learn from mistake through this driver simulation. This is an advantage because the beginner driver didn’t drive on real road but can gain the knowledge from error through this driving simulation nevertheless this is one of the safety ways for learning compare real road test. According to Kulhavy (1977) states that, Errors are usually salient, unexpected events that can motivate further learning about a task. The negative feedback provided by errors creates an element of surprise which temporarily halts task performance while learners try to work out why the error occurred.

1.3 Current system and its limitation

Most of the existing driving simulations are launch base on the architecture of driving simulator instead of choosing a system like driving simulation software. This feature consist advantage but follow with the disadvantage. The advantage of driving simulator is state by Nilsson (1993) which is the use of an advanced driving simulator has many advantages over similar real-world or on-road driving research, including experimental control, efficiency, expense, safety, and ease of data collection. The driving simulator for example like NADS is using the three dimension virtual reality technique to display the virtual environment as much similar as reality. Klee (1999) states that driving simulator could provide a realistic driving experience. But the problems are the build cost, importable and require huge space for developing a driving simulator. Due to the problem, the advantages of courseware of driving simulation comparing NADS are portable, low cost and only require a functional computer. The feature from NADS like high resolution of virtual environment is unavailable for courseware of driving simulation but simple structure will be built to ensure the requirement of most of the computer can be minimize to max. So people no need to purchase expensive high feature computer to using this courseware of driving simulation. Besides that, the courseware are portable since is target build in CD form so can easy to transfer to other computer to use it. In addition, comparing the huge size of the simulator, this courseware of driving simulation only require the computer storage for installation of this software instead of using actual home space for placing purpose. Besides that, US traffic’s rule are most common foundation for implement inside the driving simulation system, thus most of the user are learning driving through simulation but base on others country traffic’s rule. When users drive in real car in actual environment, they will drive follow the learning driving pattern inside the simulation since they get used to the driving pattern already. This will become a potential dangerous issue for them.

1.4 Terminology

NADS	National Advanced Driving Simulator
CarSimDS	CarSIm Driving Simulation

Table 1.1: Terminology in Literature Review

1.5 Scope and limitation of the study

1.5.1 Scope of the study

The scope of the study is focussing on both which are the people who having driving experience and the people who didn't having driving experience. For the people who have driving experience they can use this system as practicing. For example the people who didn't drive for a long period already, they can use this driving simulation system as a practice to recall their driving skill. Most of these kinds of people are high age adult or the worker who had go overseas country a long period. Besides that, not just assisting them to recall back their driving skill but can teaching them the traffic's rule of current time because long period of absent of driving, they maybe didn't realise any changes of the current traffic's rule compare to their memory. Secondly is for the people didn't having any driving experience they can using this driving simulation as learning and training. Thus they can learn without driving a real car on road which is safe, can learn in house which is easy and can learn wherever they want by installing the simulation into their computer which is convenient.

1.5.2 Limitations of the study

The limitation from the study is lacking of current traffic's rule knowledge, lacking of game programming knowledge and the limited of development time given.

- Lack of traffic's rule knowledge: didn't familiar with all traffic rule in Malaysia for example certain place where specific sign board need to be understand its meaning consist.
- Lacking of game programming knowledge: crucial issue for driving simulation development phase due to lacking of programming knowledge.
- Limited time give: 1 semester time (4-5 months) is given for developing this driving simulation.

PART 2

REPORT BODY

2.1 User Requirement

The collection and gathering of user requirement is using the survey technique which is questionnaire. The reason using questionnaire is because this driving simulation system need to base on what user needed as a first priority to develop and will be adding or improve certain feature compare to existing driving simulation software. The user requirement for this driving simulation development project is using questionnaire and distribute to the 30 respondents which are randomly selected. After collecting back the questionnaire the answer from the respondents is being analysis. The result consists of two parts. One is Section B for analysis the satisfaction of current existing system another one is Section C for collecting the requirement on developing new driving simulation. The result of Section B is shown below.

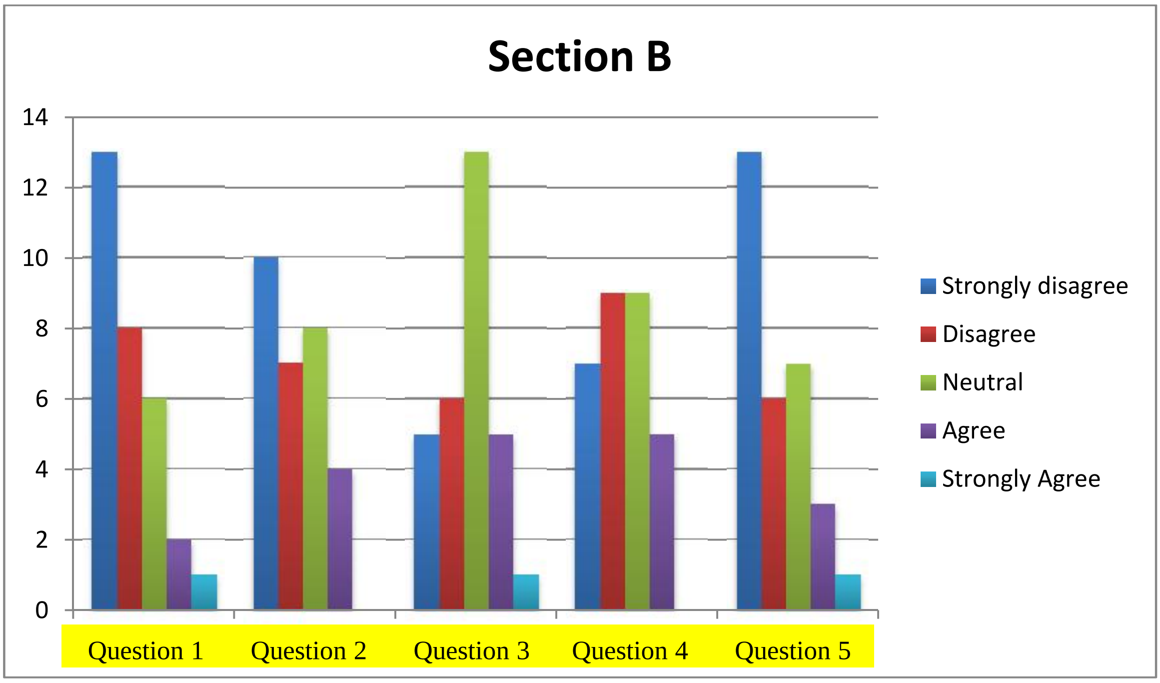


Figure 2.1: Section B in Questionnaire

The result shows that the two most highest data is the respondents did not using the driving simulation as a practice or training for their driving skill and the users notice the existing driving simulation did not follow local traffic's rule for example country Malaysia. The data show the average of the result is negative perspective for the existing driving simulation because of certain issue for example not easy to use, too expensive which users are unaffordable to bought it and certain driving simulation is require driving steering to function in order to more near realistic but will also become a expenses for user. The next histogram is showing the Section C result which is showing what the needed criteria for the driving simulation are.

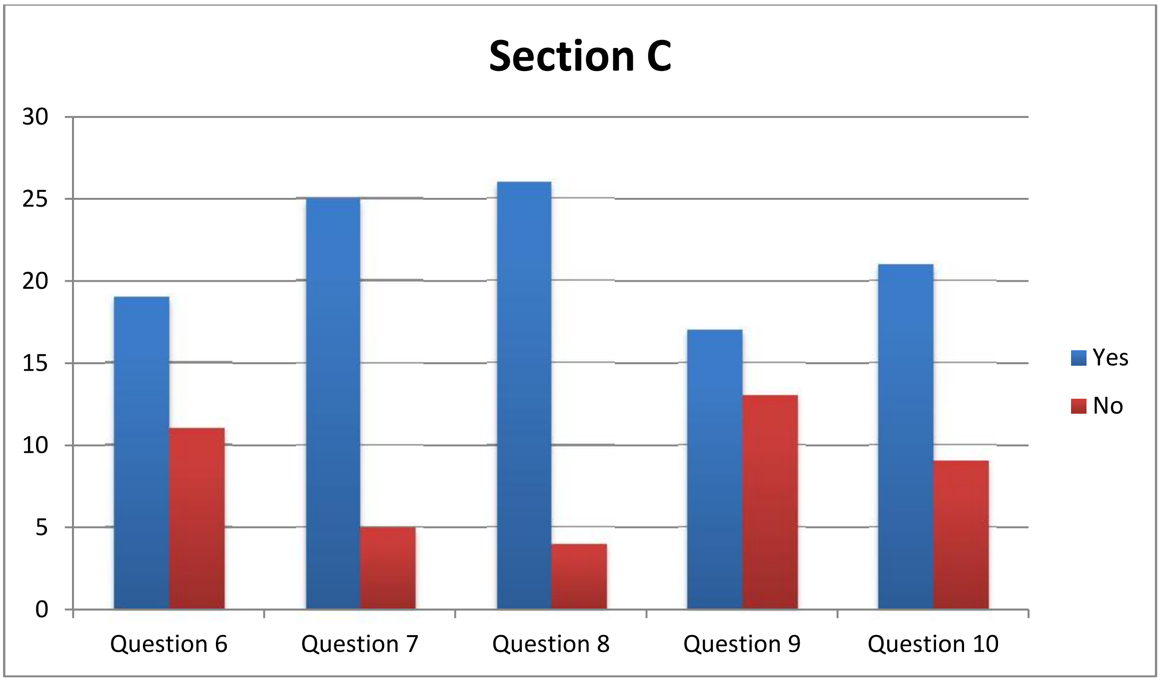
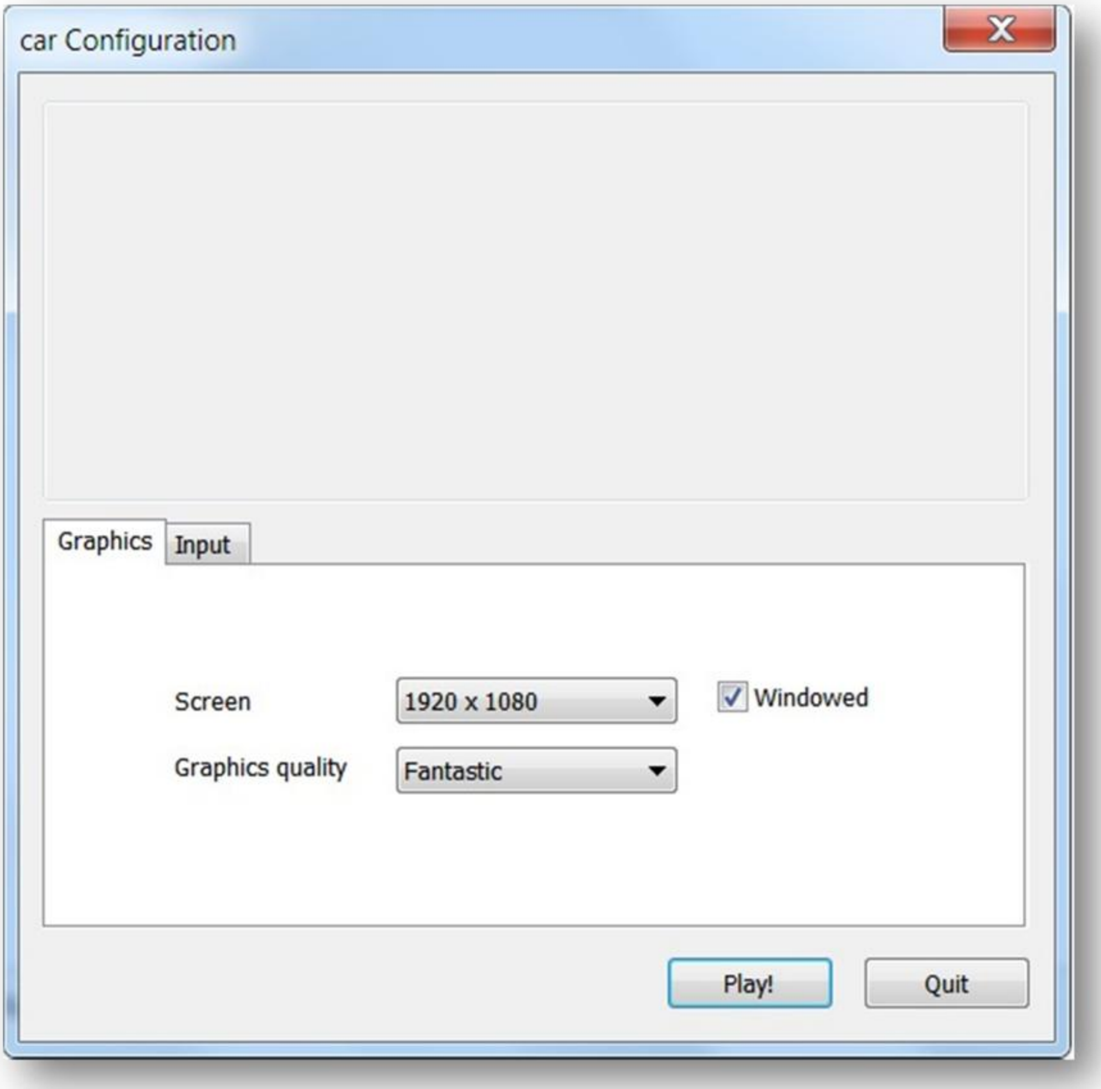


Figure 2.2: Section C in Questionnaire

This is the result from Section C from the questionnaire. The result shows that most of the respondents prefer portable, easy to locate, simple but perfect and using local traffic's rule driving simulation. The question 9's result is not so obvious maybe is because certain respondents are prefer using driving steering which more close to reality and part of the respondents are prefer using keyboard for functioning the driving simulation. Thus the new driving simulation can be develop to both controllable function by letting users to select which type of control function they want.

2.2 Design Description

The design for the driving simulation is consists few important criteria which are the driving simulation will base on local (Malaysia) traffic's rule as a foundation to design, user can change the driving learning course inside the simulation for example user can learn parking, turning, and many else. Besides that, before enter the simulation, it will enter the simulation configuration part which allow user to select the screen resolution, graphics quality, changing of input and click either want window form or not. Below is the design of the system interface.



Screen: 1920 x 1080

☑ Windowed

Graphics quality: Fantastic

Figure 2.3: Car Configuration

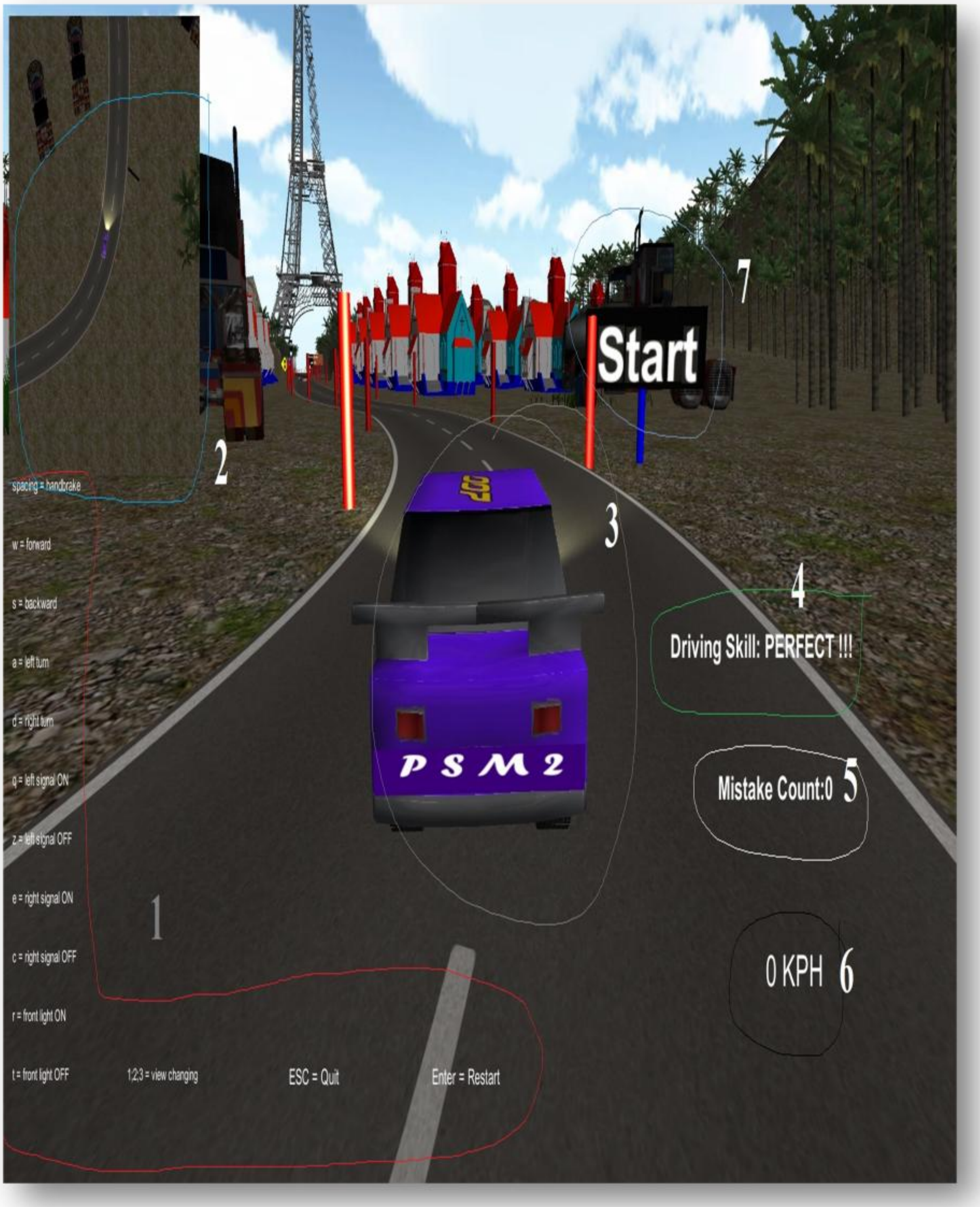


Figure 2.4: Display Interface

Number	function
1	Show the user on the functioning key on the keyboard. Can be disable the view by pressing F1 or showing the control manual by pressing F2
2	A mini map from the top view on the car to allow user observe the surrounding of the car
3	Car : main object which manipulate by user through this simulation
4	Driving Skill: showing the driving skill of the user in real time which affect by the mistake count.
5	Mistake Counts: counting the number of mistake occur by the user through this simulation
6	Speedometer: showing current speed of the car.
7	Start: Starting point of the simulation.

Table 2.1: Description of Figure 2.4

Figure 2.5: System Log-In Interface

Figure 2.6: System Pop-out Interface (when user fails)

Mistake Count during this Simulation = 1

Driving Skill = Excellent

Figure 2.7: System Ending Interface (user successful Finish)